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MAR 25 2013

Air/Toxics & Inspection
Coordination Branch
6EN-A

ExxonMobil Chemical Company
5000 Bayway Drive
P.O. Box 4004
Baytown, Texas 77522-4004

Entered into Converter 4-01-13 DL

ExxonMobil Chemical

March 21, 2013

Mr. John Blevins
Director, Compliance and Enforcement Division
US EPA, Region 6
1445 Ross Ave.
Suite 1200
Mail Code 6 EN
Dallas, TX 75202-2733

Re: Equivalency Determination Request
Multi-Point Ground Flare (MPGF)
Baytown Olefins Plant &
Mont Belvieu Plastics Plant

Dear Mr. Blevins:

ExxonMobil Chemical Company (ExxonMobil) requests an equivalency determination pertaining to the requirements of 40 CFR §60.18 and 40 CFR §63.11 as related to multi-point ground flares (MPGF) proposed as part of expansion projects occurring at two facilities - ExxonMobil's Olefins Plant in Baytown, Texas (referred to as Baytown Olefins Plant or BOP) and the ExxonMobil Plastics Plant in Mont Belvieu, Texas (referred to as Mont Belvieu Plastic Plant or MBPP). The proposed BOP MPGF will control waste gases from a new ethylene unit, and the proposed MBPP MPGF will control waste gases from a new polyethylene unit. Source-specific information on the new ethylene and polyethylene units is provided in Attachment 1 to this letter.

The two MPGFs are similar in purpose, design, and operation. Both flares will be designed as an integral part of a larger control system that will control waste gases in stages. At both facilities, waste gases are directed to a vent collection system comprised of two separate dispositions: a High Pressure (HP) disposition and a Low Pressure (LP) disposition. Simplified schematics depicting the control systems for the vent collection systems are provided as Figures 2-1 and 2-2 of Attachment 2 to this letter.

For both sites, the LP disposition will include an elevated flare that will comply with 40 CFR §60.18 and/or 40 CFR §63.11 (as applicable). The majority of waste gas flow is anticipated to be routed to the LP dispositions. Waste gases are only anticipated to be routed to the MPGF above a set pressure. Each MPGF is itself a multi-staged flare system designed to operate with multiple pressure-assisted burners to facilitate the optimal mixing of the combustion materials, in lieu of any assist medium like air or steam, in order to maintain consistent flame stability and proper combustion. The MPGF's design utilizes the kinetic energy inherent within the high pressure relief gas to passively entrain sufficient quantities of combustion air resulting in flare tip exit velocities that will exceed V_{MAX} as specified in 40 CFR §60.18(c)(3),(4) or 40 CFR 63.11(b)(6),(7),(8). A detailed technical description of the complete multi-staged flare system is provided in Attachment 2 to this letter.

<u>Equivalency Determination:</u>

Based on the information provided above and in the technical attachments noted, ExxonMobil hereby requests formal written approval to comply with 40 CFR §60.18 and/or 40 CFR §63.11(b) (as applicable) at its facilities using similar flare devices in an equivalent manner as specified here:

1. The MPGF is provided with a performance guarantee from a manufacturer that it has been designed for smokeless operation over its entire pressure operating range. As such, it will be operated as specified in 40 CFR §60.18(c)(1) and 40 CFR §63.11(b)(4), to be determined as specified in 40 CFR §60.18(f)(1) and 40 CFR §63.11(b)(4), if applicable.
2. To comply with 40 CFR §60.18(c)(2), or if applicable with §63.11(b)(5), the MPGF will be operated with at least one pilot flame present at all times for each row of operating burners in a line (called a 'runner'). The pilot burner is generally located within the first three burners in a row for each runner. These burners serve as subsequent ignition points for the remaining burners in the same row. There shall be several such runners that will be opened or closed based on the flare gas flow to the MPGF. Thermocouples or equivalent devices will be used to monitor for presence of a pilot flame. Since the overall flare system is staged, there will be no routine flame present from the MPGF burners themselves if vent gas pressure remains below the set point.
3. To comply with 40 CFR §60.18(c)(3), or if applicable with 40 CFR §63.11(b)(6), a minimum net heating value of no less than 800 British thermal units per standard cubic foot (Btu/scf) will be maintained for the gases being combusted at the MPGF. The net heating value of the waste gases to the MPGF will be monitored when waste gas is being directed to the MPGF using either calorimetry or gas chromatography (GC).
4. A permanent waiver is requested for the exit velocity requirements of 40 CFR §60.18(c)(3),(4), or if applicable 40 CFR §63.11(b)(6),(7),(8), and the corresponding determination requirements of 40 CFR §60.18(f)(4) or if applicable 40 CFR §63.11(b)(7), for each MPGF.
5. A permanent waiver from 40 CFR §60.18(c)(6) and 40 CFR §63.11(b)(2) is requested as the MPGFs are pressure assist and not steam, air, or non-assist flares.
6. Per 40 CFR §60.8(b)(4) or 40 CFR §63.7(e)(2)(iv), a permanent waiver is requested from the performance test or flare initial compliance assessment to demonstrate compliance with 40 CFR §60.18 or 40 CFR §63.11 as allowed by agency consideration. Waste gases to the MPGF are anticipated to be from large flows of short duration. Replicating the operational scenarios that would generate these large waste gas streams for the amount of time required for testing is impractical and could pose significant safety concerns in terms of data collection. Additional supporting information for this request is provided in Attachment 3 to this letter.
7. Lastly, ExxonMobil proposes additional and alternative monitoring techniques of the vent gas flow according to the manufacturer's recommendation to ensure only high pressure vent gases are routed to the MPGFs. These are proposed as alternative monitoring procedures per 40 CFR §60.13(i) and 40 CFR §63.8(f)(4). The proposed monitoring parameters and how they meet the four criteria elements of the 40 CFR §63.2 definition of monitoring is provided in Attachment 4 to this letter.

ExxonMobil is eager to discuss this request for an Equivalency Determination. If you have any questions about the information provided, please contact Benjamin Hurst at benjamin.m.hurst@exxonmobil.com or (281) 834-6110.

Sincerely,

Benjamin M. Hurst
Air Advisor
ExxonMobil Chemical Company

Enclosures

cc: Manager, TCEQ Region 12 Air Program, Houston

Attachment 1

Source Information

Baytown, TX Source

In May 2012, the ExxonMobil BOP located in Baytown, Harris County, Texas submitted a New Source Review (NSR) application to the Texas Commission on Environmental Quality (TCEQ), as well as a Greenhouse Gas (GHG) Prevention of Significant Deterioration (PSD) application to the EPA, for authorization of construction and operation of a new BOP ethylene unit. The new unit will consist of eight new ethylene cracking furnaces and associated recovery equipment. The recovery equipment include a quench tower, caustic wash facilities, a process gas compressor and interstage coolers, chiller train, refrigeration system, deethanizer, ethylene/ethane splitter, and demethanizer. The process is depicted in Figure 1-1.

The requirements of federal New Source Performance Standards (NSPS), Nation Emission Standards for Hazardous Air Pollutants (NESHAP), and/or NESHAPs for Source Categories (MACT) are potentially applicable to the proposed new equipment. Emissions control standards under potentially applicable regulations (e.g., in 40 CFR Part 60, Subpart NNN (*NSPS NNN)* and Subpart RRR (*NSPS RRR*); 40 CFR Part 63, Subpart YY (*Ethylene MACT*), etc.) require that any flare used to control waste gas from subject equipment must comply with 40 CFR §60.18 (NSPS/NESHAP) or 40 CFR §63.11 (MACT) through performance testing in 40 CFR §60.8 (NSPS/NESHAP) or 40 CFR §63.7 (MACT). The waste gases from the proposed new equipment will be controlled, in part, by a new MPGF. The MPGF is described in Attachment 2 to this letter.

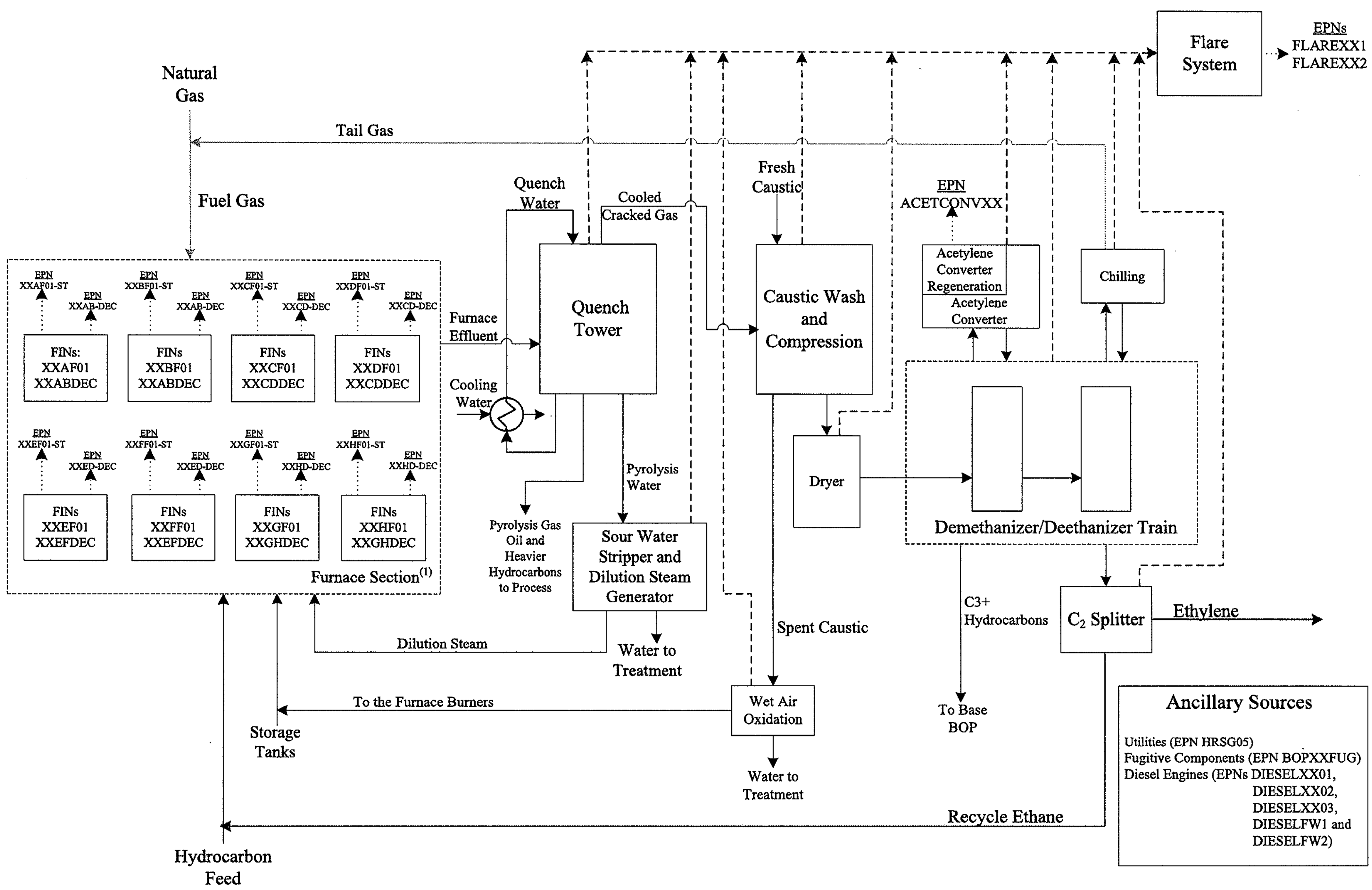
In addition to federal regulation, the MPGF will be subject to monitoring requirements under Title 30 of the Texas Administrative Code (30 TAC) Chapter 115, Subchapter B for volatile organic compounds, and Subchapter H for highly-reactive volatile organic compounds, as well as State NSR permit requirements (anticipated to be in Air Quality Permit No. 102982). Both 30 TAC Chapter 115 and the NSR permit (anticipated) refer back to the federal standards within 40 CRF §60.18. Due to the unique design of the proposed MPGF, the TCEQ rules allow the submittal of an Alternative Means of Control request for the MPGF, which was submitted in December 2012, and contains the same monitoring procedures as are proposed within this equivalency determination request.

Mont Belvieu, TX Source

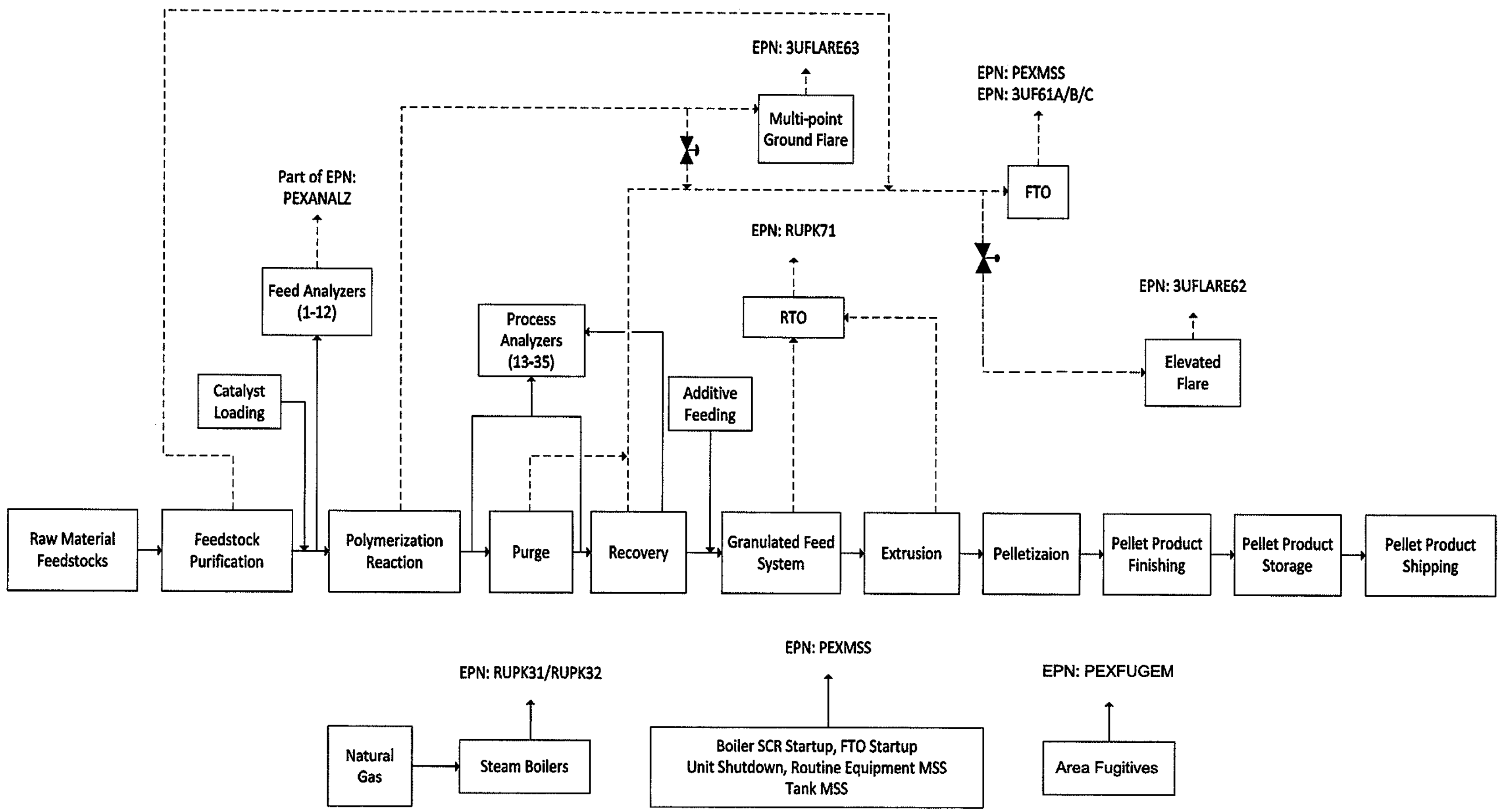
In May 2012, the ExxonMobil MBPP located in Mont Belvieu, Chambers County, Texas, submitted an NSR application to the TCEQ, as well as a GHG PSD application to the EPA, for authorization of construction and operation of a new MBPP polyethylene ethylene unit. The new unit will be used to produce polyethylene in low-pressure, gas-phase fluidized bed reactors. Catalyst, monomer, co-monomer, and inert chemicals are fed to the reactors. The polymer produced by the reactors is in the form of granules suspended by circulating gases. Product from the reactors goes through a series of polymer separation and purging stages, and is ultimately extruded into pellets. The pellets are transferred to storage silos and are packed in bags and containerized for shipping. The process is depicted in Figure 1-2.

The requirements of federal New Source Performance Standards (NSPS), Nation Emission Standards for Hazardous Air Pollutants (NESHAP), and/or NESHAPs for Source Categories (MACT) are potentially applicable to the proposed new equipment. Emissions control standards under potentially applicable regulations (e.g., in 40 CFR Part 60, Subpart DDD (*NSPS DDD);* 40 CFR Part 63, Subpart FFFF (MON *MACT*), etc.) require that any flare used to control waste gas from subject equipment must comply with 40 CFR §60.18 (NSPS/NESHAP) or 40 CFR §63.11 (MACT) through performance testing in 40 CFR §60.8 (NSPS/NESHAP) or 40 CFR §63.7 (MACT). The waste gases from the proposed new equipment will be controlled, in part, by a new MPGF. The MPGF is described in Attachment 2 to this letter.

In addition to federal regulation, the MPGF will be subject to monitoring requirements under 30 TAC Chapter 115, Subchapter B for volatile organic compounds, and Subchapter H for highly-reactive volatile organic compounds, as well as permit requirements State NSR permit requirements (anticipated to be Air Quality Permit No. 103048). Both 30 TAC Chapter 115 and the NSR permit (anticipated) refer back to the federal standards within 40 CFR §60.18. Due to the unique nature of the proposed MPGF, the TCEQ rules allow submittal of an Alternative Means of Control for the MPGF, which was submitted in December 2012, and contains the same monitoring procedures as are proposed within this equivalency determination request.



SAGE ENVIRONMENTAL CONSULTING	
Drawing: Process Flow Diagram.vsd	Figure 1-1
Revision No.: 2	Simplified Process Flow Diagram
Date: March 2013	ExxonMobil Baytown Olefins Plant
Project No.: 55-2-24	Ethylene Expansion Project



SAGE ENVIRONMENTAL CONSULTING	*Drawing:* Process Flow Diagram.vsd	Figure 1-2
	Revision No.: 2	Simplified Process Flow Diagram
	Date: March 2013	ExxonMobil Mont Belvieu Plastics Plant
	Project No.: 55-2-24	Polyethylene Expansion Project

Attachment 2

Flare Systems

Technical Description

The Baytown Ethylene Expansion and Mont Belvieu Plastics Plant Expansion projects will include "staged" control systems which will include a MPGF (Multi-Point Ground Flare). The MPGF will be manufactured by an industry leader in flare technology, such as the John Zink Company (manufacturer of the LRGO multi-point flare system). The control systems are described as "staged" because they are designed to ensure that streams are controlled appropriately based on operating conditions. Figures 2-1 and 2-2 are simplified schematics depicting the control systems for the vent collection systems for the expansions at BOP and MBPP, respectively. ExxonMobil seeks advanced authorization and approval to demonstrate equivalency prior to when the proposed new ground flare would be required to comply with 40 CFR §60.18, or 40 CFR §63.11 (i.e., approval is desired prior to start-up).

The MPGFs will control VOC emissions during the high pressure / high flow occasions. The MPGF technology has a principle application to the petroleum refining and chemical processing industries due to its staging systems that ensure short, smokeless flames maintained over the full operating range of the flare. The burner design utilizes pressure to assist combustion of waste gas by entraining an adequate amount of ambient air. Pressure-assisted flares are viewed by combustion experts as among the highest destruction and removal efficiency (DRE) flares available. Requirements in 40 CFR §60.18 and 40 CFR §63.11 limit the heating value and exit velocity of the waste streams routed to applicable flares to ensure the design and operation of these flares achieve the required destruction efficiency with the benefits of their particular assist methods. Background information that was used to establish the heating value and exit velocity for 40 CFR §60.18 and 40 CFR §63.11 does not include MPGF systems, and therefore, the limit of maximum exit velocity should not apply to the proposed MPGFs. Establishing a minimum heating value combined with stable flame design will ensure good combustion of the waste gas at the flare tip. Limiting the exit velocity would impact the pressure-assisted burner by preventing it from reaching its critical pressure (hence preventing from entraining adequate amount of air for mixing and proper combustion), and would not allow the flare to operate at its design conditions.

The proposed MPGFs will use a fixed position array of high pressure burners within a secure fenced area to produce short, highly efficient open-air flames. Pressure-assisted burners utilize the flare gas pressure to ensure high exit velocity at the burner exit. The high velocity produces the energy required to promote high air entrainment and mixing in the combustion zone. This entrainment / mixing energy in the combustion zone is the key to producing an efficient, smokeless flame. This energy level is created by a high velocity discharge without requiring supplemental energy such as steam or forced air blowers. The philosophy of the control system provides that when gas (energy) flow is low, the number of burners is reduced in order that there is sufficient fuel supply to each burner to maintain the required energy level for clean burning.

The MPGFs will be designed with multiple headers, each header having multiple risers with burners. The burners will be designed such that a number of small diameter ports eject high velocity gas, enhancing air entrainment and mixing for efficient and clean combustion. The aerodynamics of the burners provides air cooling and prevents flame recirculation, eliminating burner over-heating and internal coking. The staging control system, which can be either programmable logic controller (PLC) or distributed control system (DCS) based, will receive input from pressure transmitters and open and close staging valves according to waste gas pressure. Each stage will be operated automatically with an actuated valve that opens or closes upon demand.

MPGF at Baytown, TX Source:

The flare system for the Baytown Ethylene Expansion unit project will include a "staged" control system that will consist of an elevated flare and a MPGF (Multi-Point Ground Flare). The control system is described as "staged" because it is designed to ensure that streams are controlled appropriately based on operating conditions. The vent collection system feeding the control system is comprised of one common header. Figure 2-1 is a simplified schematic depicting the control system for the vent collection system.

The common flare header will receive routine continuous vent streams and routine intermittent vent streams from the process. The streams which make-up less than 1% of the MPGF rated capacity will be controlled by the steam-assisted elevated flare. The common header will operate at low pressure, until the rate through the common flare header exceeds the capacity of the steam assisted elevated flare (equivalent to 1% of the MPGF capacity). A performance test / flare initial compliance assessment will be conducted for the elevated flare, and it will be operated in accordance with 40 CFR §60.18 and/or 40 CFR §63.11.

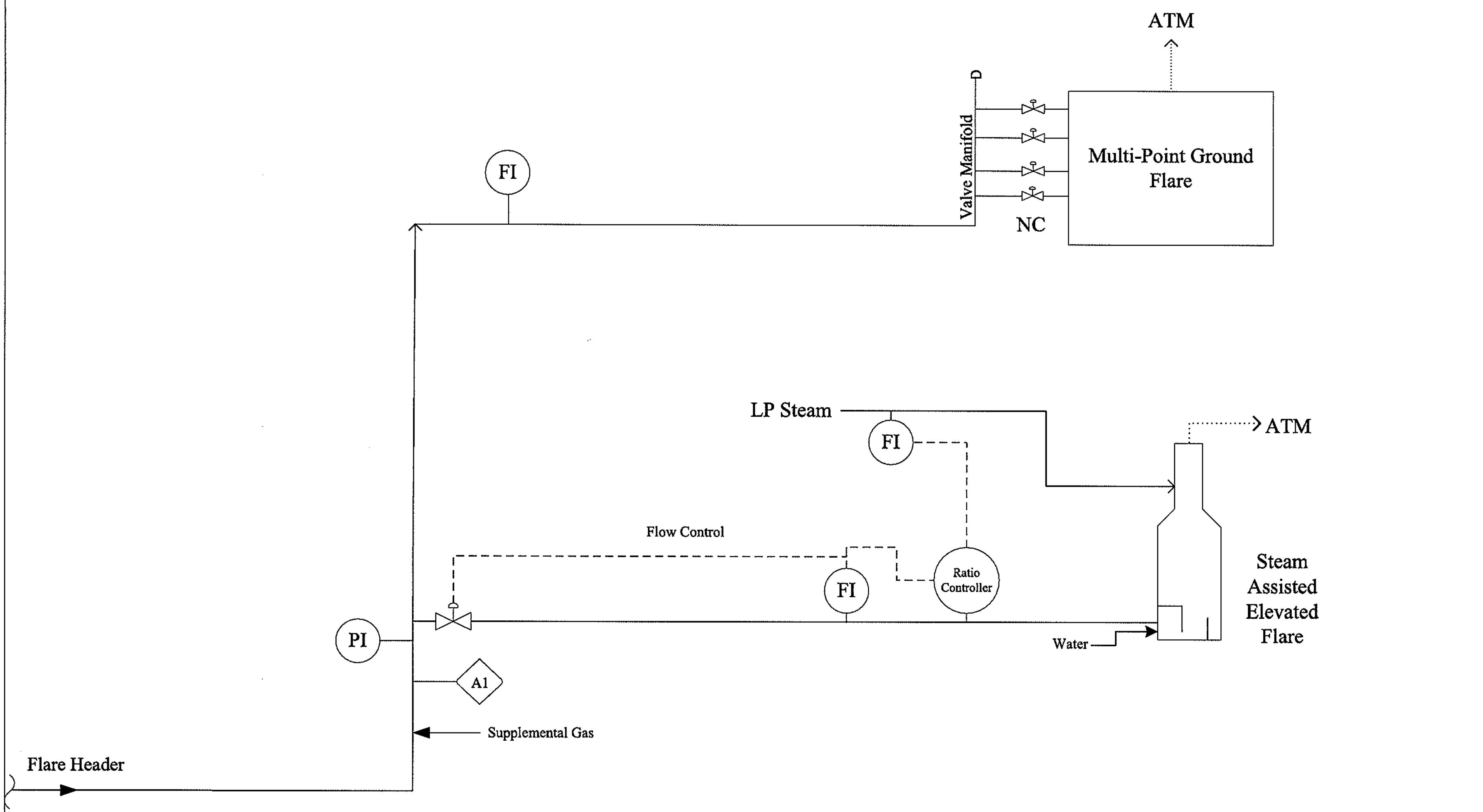
When the total rate through the flare header exceeds the capacity of the elevated flare, a control valve will limit the rate to the elevated flare to that of its design, and divert any excess flow to the MPGF. When the back pressure in the flare header rises to the design pressure, the first staging valve of the MPGF opens. This may occur during defined periods of unit purging for shutdowns or startups. The flare system computer control application ensures that the MPGF is operated only at times when the header meets the design conditions.

MPGF at Mont Belvieu, TX Source:

The MPGF will be part of a "staged" control system that will consist of flameless thermal oxidizers (FTOs), an elevated flare, and the MPGF. The control system is described as "staged" because it is designed to ensure that streams are controlled appropriately based on operating conditions. The vent collection system feeding the control system is comprised of two separate headers: a High Pressure (HP) Vent Header and a Low Pressure (LP) Vent Header. Figure 2-2 is a simplified schematic depicting the control system for the vent collection system.

The LP Vent Header will receive routine continuous vent streams and routine intermittent vent streams from the process. The streams are also referred to as "low volume, low pressure" (LVLP) streams, and will be controlled by FTOs and an elevated flare assisted by either steam or air. The HP Vent Header is designed to receive high load, short duration vent streams, also referred to as "high volume, high pressure" (HVHP) vent streams. The control device that will control emissions on the HP Vent Header is the proposed MPGF. A performance test/flare initial compliance assessment will be conducted for the elevated flare, and it will be operated in accordance with 40 CFR §60.18 and/or 40 CFR §63.11.

The two separate headers (HP and LP) are connected through a spill-over line with a HP to LP valve controlled by a computer control application which is used to direct the flow away from the HP header system. This may occur during defined periods of unit purging for shutdowns or startups. This computer control application will also divert flow from the HP Vent Header to the LP Vent Header upon instances when the HVHP vent does not have adequate operating pressure. This computer control application ensures the MPGF is operated only at times when the HP Vent Header meets the design conditions.



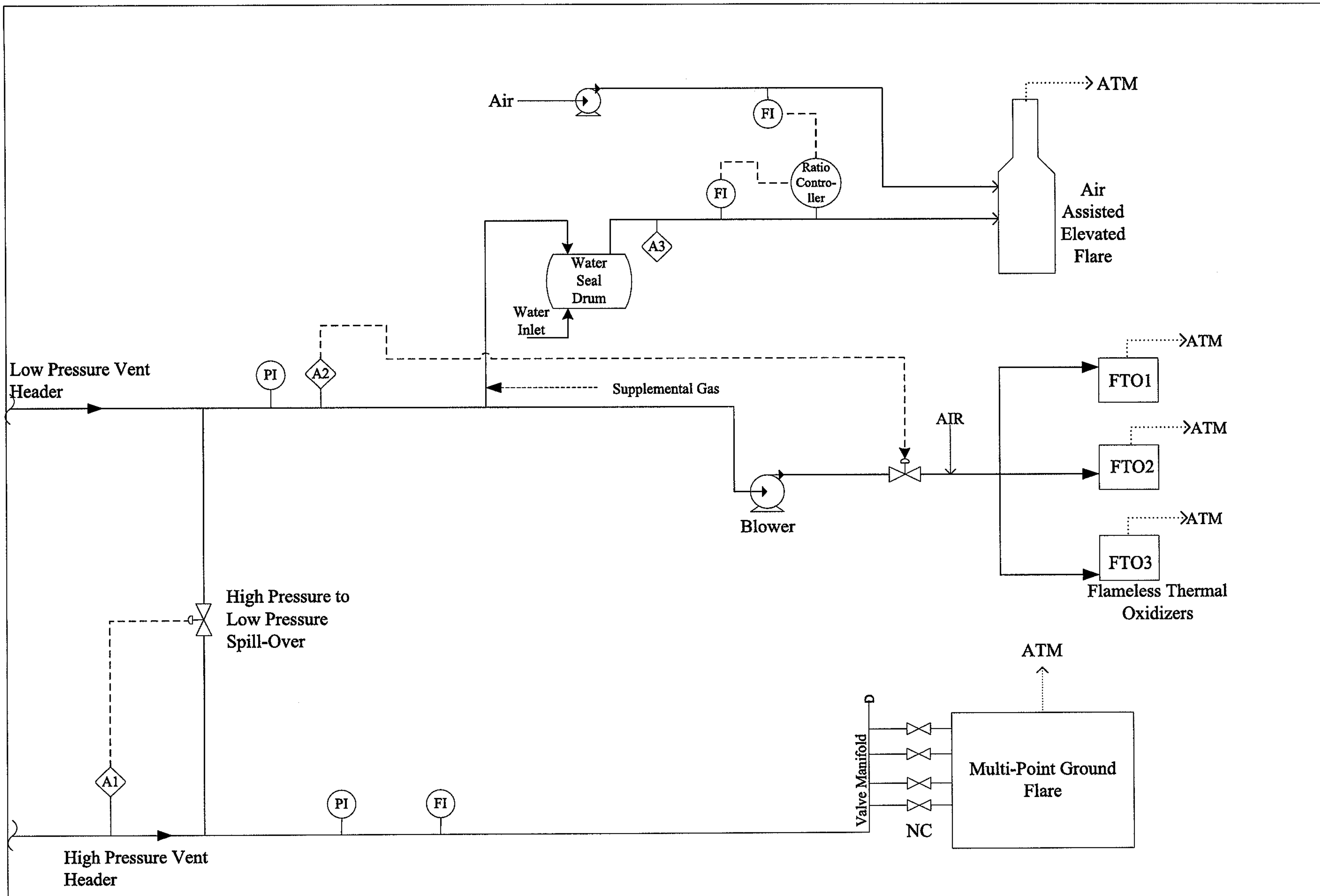
A Heat content online analyzer or gas chromatograph (to be determined)

Vent Collection System Flare Headers Simplified Schematic

ExxonMobil Baytown Ethylene Expansion Unit

Date: March 2013

Figure 2-1



A Heat content online analyzer or gas chromatograph (to be determined)

SAGE ENVIRONMENTAL CONSULTING

Vent Collection System Flare Headers Simplified Schematic

ExxonMobil Mont Belvieu Plastics Plant

Date: March 2013

Figure 2-2

Attachment 3

Performance Test Waiver Supporting Information

Performance Testing

Applicable 40 CFR Subparts require performance testing under 40 CFR §60.8 and 40 CFR §63.7. Performance test requirements per 40 CFR §60.8(b) and 40 CFR §63.7(e)(2)(iv) are as follows:

> *Performance tests shall be conducted and data reduced in accordance with the test methods and procedures contained in each applicable subpart* ***unless the Administrator*** *(1) specifies or approves, in specific cases, the use of a reference method with minor changes in methodology, (2) approves the use of an equivalent method, (3) approves the use of an alternative method the results of which he has determined to be adequate for indicating whether a specific source is in compliance,* ***(4) waives the requirement for performance tests because the owner or operator of a source has demonstrated by other means to the Administrator's satisfaction that the affected facility is in compliance with the standard...***

Given that the MPGF's fundamental design for enhanced ambient air entrainment relies on high flare tip exit velocities, demonstrating velocities below the V_{MAX} during the performance test would not show proper operation of the control device. The heating value of the waste gas is related to proper operation and will be continuously monitored as described in Attachment 4 to this letter. Stable, smokeless flames and high destruction efficiency will be continuously ensured during the MPGF's operation. This is considered equivalent to meeting 40 CFR §60.18 and 40 CFR §63.11, and thus, a waiver from testing is requested. Please note also that the waste gas controlled by the MPGF are expected to result from large flows of short duration. Replicating the operational scenario that would generate HVHP streams for the amount of time required for testing is impractical and could pose safety concerns.

Furthermore, testing of the burners is considered unnecessary given that destruction efficiency evaluation data is available for similar ground flares. The EPA Air Pollution Control Cost Manual, 6th Ed., acknowledges that pressure-assisted flares use high vent gas pressure to promote mixing at the burner tip, and the EPA has been involved with or aware of the following studies which report DRE results:

- *Flare Efficiency Study*, EPA Document No. 600/2-83-052, July 1983
- *Evaluation of the Efficiency of Industrial Flares: Flare Head Design and Gas Composition*, EPA Document No. 600/2-85-106, September 1985
- Varner et al., 2007, Docket ID No. EPA-HQ-OAR-2010-0868

Table 4 (attached) of EPA Document No. 600/2-83-052 shows an array of > 99% combustion efficiency results for tests where the exit velocity exceeds V_{MAX}. Furthermore, test numbers 1-5, 7, 8, and 67 demonstrate that, at high exit velocities and high lower heating values, combustion efficiencies ≥ 99.8% are expected. Testing conducted by John Zink specifically for linear relief gas oxidizer (LRGO) burners and provided to EPA demonstrate similar results with an overall combustion efficiency of 99.82% (also attached). The burners for the MPGF in this equivalency determination request will be the same or similar to the burners tested

In the referenced testing, propylene mixtures were used to demonstrate performance. Propylene's high Btu content makes it comparable to the composition of the streams that will be combusted in the proposed MPGFs. However, in other regards, propylene is a conservative stream to test DRE in a pressure-assist system because ethylene has a more stable flame (i.e., wider flammability range, higher burning velocity, and lower ignition temperature) than propylene. Thus, propylene would result in lower tested combustion efficiencies than ethylene.

Conclusion

Because sufficient test data demonstrating the performance of the proposed burners is readily available, no further testing is proposed. Furthermore, John Zink has guaranteed performance of the MPGFs' burners over the operating envelope discussed in Attachment 4 and as documented in Attachment 5.

TABLE 4. STEAM-ASSISTED FLARE SUMMARY

Test Conditions		Test Number	Relief Gas* Flow (SCFM)	Exit Velocity (ft/min)	Lower Heating Value (Btu/SCF)	Propylene Flow (lbs/hr)	Propylene Flow (SCFM)	Nitrogen Flow (lbs/hr)	Nitrogen Flow (SCFM)		Steam Flow (lbs/hr)	Steam-to-Relief Gas Ratio (lb/lb)	Combustion Efficiency Percent
High Btu Content	Decreasing Flow Rate	1	473	2,523	2,183	3,138	473	0	0		2,159	0.688	99.96
High Btu Content	Decreasing Flow Rate	2	464	2,475	2,183	3,078	464	-	-		1,564	0.508	99.82
High Btu Content	Decreasing Flow Rate	3	456	2,432	2,183	3,027	465	-	-		1,355	0.448	99.82
High Btu Content	Decreasing Flow Rate	4	283	1,509	2,183	1,875	283	-	-		-	-	98.80**
High Btu Content	Decreasing Flow Rate	8	157	837	2,183	1,044	157	-	-		-	-	98.81**
High Btu Content	Decreasing Flow Rate	7	154	821	2,183	1,019	154	-	-		722	0.757	99.84
High Btu Content	Decreasing Flow Rate	5	149	795	2,183	991	149	-	-		1,543	1.56	99.94
High Btu Content	Decreasing Flow Rate	67	148	789	2,183	980	148	-	-		711	0.725	See pg. 28.
High Btu Content	Low Flow Rate	17	24.5	131	2,183	162	24.5	-	-		150	0.926	99.84
High Btu Content	Low Flow Rate, Excessive Steam Flow Rates	50	24.4	130	2,183	162	24.4	-	-		498	3.07	99.45
High Btu Content	Low Flow Rate, Excessive Steam Flow Rates	56	24.5	131	2,183	163	24.5	-	-		562	3.45	99.70
High Btu Content	Low Flow Rate, Excessive Steam Flow Rates	61	25.0	133	2,183	166	25.0	-	-		941	5.67	82.18
High Btu Content	Low Flow Rate, Excessive Steam Flow Rates	55	24.7	132	2,183	164	24.7	-	-		1,125	6.86	68.95
Low Btu Content	Decreasing Flow Rate	57	703	3,749	294	629	94.8	2,663	608	23.6	497	0.150	99.90
Low Btu Content	Decreasing Flow Rate	11(a)	660	3,520	305	612	92.2	2,489	568	24.6	-	-	99.93
Low Btu Content	Decreasing Flow Rate	11(b)	599	3,195	342	623	93.9	2,210	505	28.2	-	-	99.86
Low Btu Content	Decreasing Flow Rate	11(c)	556	2,965	364	616	92.8	2,028	463	30.4	-	-	99.82
Low Btu Content	Decreasing Flow Rate	59(a)	591	3,152	192	345	52	2,361	539	14.6	-	-	98.11
Low Btu Content	Decreasing Flow Rate	59(b)	496	2,645	232	350	52.7	1,942	443	18	-	-	99.32
Low Btu Content	Decreasing Flow Rate	60	334	1,781	298 209	212	32	1,325	302	16	-	-	98.92
Low Btu Content	Decreasing Flow Rate	51	325	1,733	309	305	46	1,222	279	25	256	0.168	98.66
Low Btu Content	Decreasing Flow Rate	16(a)	320	1,707	339	329	49.6	1,182	270	27.8	-	-	99.74
Low Btu Content	Decreasing Flow Rate	16(b)	252	1,344	408	313	47.2	897	205	34.9	-	-	99.75
Low Btu Content	Decreasing Flow Rate	16(c)	194	1,035	519	307	46.2	650	148	47.2	-	-	99.74
Low Btu Content	Decreasing Flow Rate	16(d)	159	848	634	307	46.3	496	113	62	-	-	99.78
Low Btu Content	Purge Flow Rate***	54	0.356	1.90	209	0.226	0.0341	1.41	0.322		-	-	99.90
Low Btu Content	Purge Flow Rate***	23	0.494	2.63	267	0.451	0.0680	2.13	0.487		-	-	100.01
Low Btu Content	Purge Flow Rate***, Excessive Steam Flow Rates	52	0.556	2.96	268	0.452	0.0682	2.14	0.488		201	77.5	98.82
Low Btu Content	Purge Flow Rate***, Excessive Steam Flow Rates	53	0.356	1.90	209	0.226	0.0341	1.41	0.322		201	123	99.40

* All values at standard conditions of 70°F and 29.92 in Hg.

** Not accounting for carbon present as soot (see Table 10).

*** For purge flows the pilot contributed greater than 95% of the total combustible gas to the flare.

JOHN ZINK COMPANY

ALLEGHENY INTERNATIONAL

4401 South Peoria Avenue
Tulsa, Oklahoma 74105
918/747-1371 Telex 497414

February 17, 1984

U.S. Environmental Protection Agency
Research Traiangle Park, NC 27711

Attention: Leslie Evans
Chemical Process Branch

Gentlemen:

Please find enclosed data from LRGO tests conducted at John Zink Company on June of 1982. ES-Test No. 81 covers a John Zink LRGO firing 2,800 lb/hr of crude propylene on an LRGO burner with 1.312 sq. in. orifice area. The propylene temperature was 150°F.

We trust this information will be of assistance in your efforts to determine LRGO efficiency. Please advise if we can be of further assistance.

Yours truly,

JOHN ZINK COMPANY

MK/tac
Enclosure

ES ENGINEERING-SCIENCE
3109 NORTH INTERREGIONAL • AUSTIN, TEXAS 78722 • 512/477-9901
CABLE ADDRESS: ENGINSCI
TELEX: 77-6442

November 12, 1982

Mr. Roger Noble
John Zink Company
4401 S. Peoria
Tulsa, Oklahoma 74105

Dear Roger:

This letter is in response to your inquiry regarding the analytical methods used to determine the emissions from several JZ flares tested by Engineering-Science, Inc., on June 30 and July 1, 1982. The analysis techniques and quality assurance activities employed for these tests were the same as those used by ES to conduct a series of flare efficiency tests for the U. S. Environmental Protection Agency (EPA) and the Chemical Manufacturers Association (CMA) in June 1982.

The details of the test protocol are detailed in a report prepared by ES and provided to EPA and CMA entitled, "A Report on a Flare Efficiency Study". Copies of this report are available from:

Chemical Manufacturers Association
2501 M Street N.W.
Washington, D.C. 20037
202/887-1100

Enclosed is a diagram from this report that summarizes the flare sampling and analysis system.

Sincerely,

Marc D. McDaniel
kg

Marc D. McDaniel
Project Manager

Encl.

/kg

TEST 81
TEST DATA SUMMARY
(BACKGROUND CORRECTED)

OVERALL COMBUSTION EFFICIENCY = 99.82%

TIME	PROBE HGT(FT)	PROBE TEMP(C)	PPM SO2	NOX	CO	CO2	THC	O2 (%)	WS (MPH)	WD (DEG)	AMBIENT TEMP(C)	OBS CE %
30/18:01:34	37:00	157.7	0.085	2.05	0.6	2867.	-1.1	20.85	4.9	198.	36.52	100.02%
30/18:01:46	37:00	155.6	0.016	4.16	-1.1	5037.	-1.2	20.30	4.6	183.	36.47	100.04%
30/18:01:58	37:00	153.3	0.001	2.44	1.9	4112.	-1.2	20.37	5.6	214.	36.38	99.98%
30/18:02:15	37:00	186.1	-.006	1.50	2.6	2982.	-1.4	20.60	3.2	202.	36.51	99.96%
30/18:02:27	37:00	221.8	0.101	1.18	5.3	2722.	-1.4	20.76	3.4	214.	36.55	99.86%
30/18:02:40	37:00	194.6	0.092	4.98	10.0	5647.	-1.3	20.40	5.6	206.	36.41	99.85%
30/18:02:52	37:00	190.0	0.005	4.92	6.6	6347.	-1.3	19.95	2.7	198.	36.53	99.92%
30/18:03:08	37:00	257.1	0.138	1.72	2.2	3932.	-1.4	20.47	4.9	193.	36.51	99.98%
30/18:03:21	37:00	273.8	0.070	7.69	3.9	7652.	-1.3	20.15	2.4	228.	36.61	99.97%
30/18:03:33	37:00	303.8	0.267	7.34	5.4	9157.	-1.1	19.62	4.0	208.	36.66	99.95%
30/18:03:45	37:00	276.1	0.131	12.63	4.8	12967.	0.3	19.72	3.5	206.	36.71	99.96%
30/18:03:57	37:00	274.1	0.050	9.22	5.5	11632.	0.6	18.64	3.4	221.	36.71	99.95%
30/18:04:14	37:00	258.2	0.019	4.34	5.3	7322.	0.6	19.61	4.4	203.	36.79	99.92%
30/18:04:26	37:00	233.8	0.081	2.37	11.9	5232.	0.6	19.99	5.0	209.	36.68	99.76%
30/18:04:39	37:00	228.3	0.007	3.11	14.6	4917.	0.4	20.06	3.7	195.	36.64	99.70%
30/18:04:51	37:00	210.5	0.030	1.84	12.0	3732.	-0.1	20.20	3.9	223.	36.57	99.68%
30/18:05:07	37:00	195.5	-.003	1.24	4.1	2772.	-0.3	20.33	4.2	215.	36.53	99.86%
30/18:05:20	37:00	188.3	-.009	0.41	4.0	1852.	-0.4	20.47	4.4	213.	36.55	99.81%
30/18:05:32	37:00	180.2	0.046	0.06	1.8	1322.	-0.5	20.58	4.3	224.	36.58	99.90%
30/18:05:44	37:00	185.8	0.093	0.72	2.7	1727.	-0.9	20.51	3.7	223.	36.51	99.89%
30/18:05:56	37:00	205.4	0.004	2.80	4.5	3362.	-0.8	20.24	4.0	217.	36.55	99.89%
30/18:06:13	37:00	289.1	0.132	3.39	0.6	4272.	-1.1	20.15	5.8	206.	36.56	100.01%
30/18:06:25	37:00	242.4	0.123	8.86	1.2	8487.	-1.2	19.59	3.8	194.	36.46	100.00%
30/18:06:38	37:00	272.8	0.015	8.01	1.7	9262.	-1.1	19.05	4.9	219.	36.41	99.99%
30/18:06:50	37:00	292.6	0.159	4.94	2.3	7312.	-0.9	19.59	4.1	207.	36.40	99.98%
30/18:07:06	37:00	341.3	0.113	10.26	-2.2	10647.	-0.7	19.01	2.7	214.	36.67	100.03%
30/18:07:19	37:00	368.9	0.187	11.57	-1.5	12027.	-0.8	18.94	3.5	208.	36.81	100.02%
30/18:07:31	37:00	433.3	0.216	17.08	-0.9	16557.	-0.5	18.20	2.6	193.	37.01	100.01%
30/18:07:43	37:00	453.6	0.246	19.01	1.3	19732.	-0.2	17.61	2.9	222.	37.05	99.99%
30/18:07:55	37:05	409.1	0.230	21.17	3.2	22267.	1.7	17.16	3.7	223.	37.01	99.98%
30/18:08:12	37:06	382.2	0.116	15.37	9.7	18787.	2.2	17.56	2.9	202.	37.11	99.94%
30/18:08:24	37:06	386.4	0.040	10.06	25.2	14212.	2.0	18.38	2.9	225.	37.19	99.81%
30/18:08:37	37:06	418.1	0.108	6.10	45.1	10367.	1.3	19.25	3.1	215.	37.17	99.55%
30/18:08:49	37:06	402.1	0.164	9.54	48.4	11617.	1.4	19.29	2.2	202.	37.34	99.57%
30/18:09:05	37:06	425.2	0.178	11.72	41.3	13552.	1.4	18.64	2.0	203.	37.54	99.69%
30/18:09:18	37:06	492.9	0.269	14.38	28.0	15462.	1.1	18.43	2.8	202.	37.66	99.81%
30/18:09:30	37:06	493.7	0.720	24.20	19.1	22712.	2.6	17.46	4.1	193.	37.55	99.90%
30/18:09:42	37:06	454.2	0.701	26.47	23.0	26847.	8.0	16.23	4.3	187.	37.33	99.88%
30/18:09:54	37:06	395.7	0.266	18.35	21.6	22017.	10.6	16.83	2.2	208.	37.41	99.85%
30/18:10:11	37:06	400.5	0.244	6.92	37.4	12767.	10.3	18.71	3.3	210.	37.49	99.63%
30/18:10:23	37:06	378.1	0.161	9.30	52.7	12527.	9.1	18.95	3.3	251.	37.45	99.51%
30/18:10:36	37:06	274.5	0.137	6.73	53.5	10692.	8.0	19.08	5.1	235.	37.32	99.43%
30/18:10:48	37:06	293.7	0.056	6.24	44.8	9287.	7.0	19.35	3.7	207.	37.28	99.45%
30/18:11:04	37:06	274.4	0.030	2.37	37.6	5727.	6.1	19.88	4.5	204.	37.18	99.24%
30/18:11:17	37:06	256.0	0.021	0.91	31.8	3702.	5.0	20.23	3.2	187.	37.07	99.01%
30/18:11:29	37:06	306.2	0.017	0.21	25.9	2447.	4.3	20.42	3.4	198.	37.08	98.78%
30/18:11:41	37:06	276.7	0.141	3.84	21.1	4667.	3.6	20.34	3.9	192.	37.06	99.47%
30/18:11:53	37:06	247.4	0.034	7.54	16.0	7927.	3.1	19.44	4.2	218.	37.02	99.76%

218. 37.02 99.76%

TEST 81
TEST DATA SUMMARY
(BACKGROUND CORRECTED)

OVERALL COMBUSTION EFFICIENCY = 99.82%

TIME	PROBE HGT(FT)	PROBE TEMP(C)	PPM SO2	PPM NOX	PPM CO	PPM CO2	PPM THC	O2 (%)	WS (MPH)	WD (DEG)	AMBIENT TEMP(C)	OBS CE %
30/18:12:10	37:06	228.0	0.014	2.98	14.4	5327.	2.0	19.78	3.4	220.	37.15	99.69%
30/18:12:22	37:06	216.3	0.014	1.16	12.1	3347.	1.6	20.18	4.2	223.	37.01	99.59%
30/18:12:35	37:06	202.4	0.006	0.67	8.5	2322.	1.3	20.38	3.2	204.	37.03	99.58%
30/18:12:47	37:06	189.5	0.005	0.25	6.8	1607.	0.7	20.47	3.1	224.	37.10	99.53%
30/18:12:59	37:06	193.4	0.083	0.06	4.6	1212.	0.3	20.53	3.0	233.	37.16	99.59%
30/18:13:16	37:06	173.7	0.009	3.50	7.0	3797.	0.0	20.08	4.0	203.	37.18	99.82%
30/18:13:28	37:06	165.3	0.001	1.67	4.3	2922.	-0.2	20.17	3.8	224.	37.15	99.86%
30/18:13:40	37:06	168.5	-.003	0.55	1.4	1777.	-0.7	20.38	3.7	185.	37.12	99.96%
30/18:13:53	37:06	168.6	0.003	0.62	-1.0	1412.	-0.8	20.49	5.2	199.	37.04	100.13%
30/18:14:09	37:06	171.5	0.043	1.24	2.7	1797.	-0.8	20.41	3.7	200.	36.96	99.90%
30/18:14:22	37:06	214.7	0.005	1.64	0.0	2192.	-1.0	20.33	2.9	185.	36.99	100.04%

TEST 81
STATISTICAL SUMMARY

	PROBE TEMP(C)	SO2 (PPM)	NOX (PPM)	O2 (PCT)	CO (PPM)	CO2 (PPM)	THC (PPM)	WS (MPH)	WD (DEG)	AMBIENT TEMP(C)	COMBUSTION EFFICIENCY
AVERAGE	276.0	0.105	6.37	19.57	12.8	7982.	1.2	3.7	209.	36.9	99.8
STANDARD DEVIATION	96.5	0.141	6.40	1.07	15.3	6324.	3.1	0.9	14.	0.4	0.2
NUMBER OF OBSERVATIONS	59	59	59	59	59	59	59	59	59	59	59
AVERAGE BACKGROUND	42.0	0.027	0.84	20.92	3.3	423.	5.7	3.0	185.	34.9	

BACKGROUND AMBIENT MEASUREMENTS

BACKGROUND FILE	TIME BEGIN	TIME END
BACKGROUND 43	30/17:41:20	30/17:48:34
BACKGROUND 44	30/18:19:38	30/18:33:07

Attachment 4

Alternative Monitoring Methods

Alternative Monitoring Methods

The monitoring of control devices subject to 40 CFR Subparts are generally applicable to §60.13(i) and §63.8(f). As stated in 40 CFR §63.8(f)(2):

> *The Administrator may approve alternatives to any monitoring methods or procedures of this part...*

Related to alternative monitoring, 40 CFR §63.8(f)(4) states:

> *The application must contain a description of the proposed alternative monitoring system which addresses the four elements contained in the definition of monitoring in §63.2 and a performance evaluation test plan, if required, as specified in paragraph (e)(3) of this section...*

The four elements of the 40 CFR §63.2 definition of monitoring are: indicator of performance, measurement technique, monitoring frequency, and averaging time.

ExxonMobil proposes the following alternative monitoring methods:

1. Monitor and record the line pressure to the MPGF when there is waste gas routed to the MPGF to ensure the line pressure exceeds 4 psig at operating temperature over a one-hour block average;

2. Monitor and record the net heating value of the vent gas sent to MPGF using an on-line analyzer system when there is waste gas routed to the MPGF;

3. Maintain, with the addition of supplemental fuel as necessary, a minimum net heating value of 800 Btu/scf of the vent gas (adjusted for hydrogen) over a one-hour block average when there is waste gas routed to the MPGF system; and

4. Monitor and maintain at least one operating pilot flame on each stage/runner of the MPGF when there is waste gas routed to the MPGF system.

Indicator of performance – The pressure and heating value constraints above are the operating ranges over which combustion performance of the MPGF has been found to be optimum in the past. In addition, John Zink has guaranteed performance of the MPGF's burners over the operating range in a letter included as Attachment 5.

Measurement technique – The pressure in the vent header will be known through input from pressure transmitters and staging will be computer-controlled.

The heating value of the vent gas will be calculated from composition data which will be determined through GC and/or calorimeters. Most waste gas streams that will be routed to the MPGF will consistently have a net heating value in excess of 800 Btu/scf, but there may be a few instances where the waste gas will contain appreciable quantities of hydrogen. It is widely known that hydrogen contributes to good combustion more than its volumetric net heating value of 274 Btu/scf would imply. Most notably, hydrogen contributes to good combustion as a result of a high flame speed. In an effort to address this consideration, an adjustment to the volumetric heating value of hydrogen is made when calculating the net heating value of waste gas streams routed to flares. This net heating value of hydrogen as adjusted[1] is 1,212 Btu/scf and accurately reflects the realized contribution hydrogen makes to the good combustion of waste gas streams routed to flares.

[1] The most recent example of this adjustment to the net heating value of hydrogen is contained in the United States of America v. Marathon Petroleum Company LP and Cattlesburg Refining, LLC Consent Decree signed April 5, 2012. The "net heating value of hydrogen as adjusted" discussion is contained in Section III Definitions and Appendix 1.3: http://www.epa.gov/compliance/resources/decrees/civil/caa/marathonrefining-cd.pdf

Monitoring frequency - Except for periods of system malfunction, repairs, calibration checks, periodic maintenance, and zero and span adjustments as required, all continuous monitoring systems shall be capable of monitoring and recording at least four data points per hour (continuous operation).

Averaging time – Hourly vent gas header pressure will be monitored and recorded on a fifteen-minute block basis when the MPGF is in operation. Hourly net heating values will be determined by GC and/or calorimeter on a fifteen-minute block basis when the MPGF is in operation.

The alternative monitoring methods proposed in this equivalency determination meet the four elements of the §63.2 definition of monitoring. ExxonMobil proposes that operation of the MPGF within the operating parameters above is considered equivalent to compliance with 40 CFR §60.18, or 40 CFR §63.11.

Please note that if a lower pressure and/or lower heating value can be demonstrated to achieve the same level of combustion efficiency through vendor tests, industry studies, calculations, etc., then these lower limits will be documented and implemented.

A performance evaluation test plan is impractical to conduct at the site due to the amount of waste gas that would need to be generated for the test and the means of generating it. A test conducted at the site could also pose significant safety concerns in terms of data collection.

Attachment 5

Vendor Guarantee

JOHN ZINK.

International Headquarters
PO Box 21220
Tulsa, OK 74121-1220
918/234-1800

November 5, 2012

Subject: LRGO Multi-Point Ground Flares
Flare Burner Emissions Guarantees

Ref: Baytown Olefins Plant.

Dear Sir / Madam:

John Zink Co has reviewed the processes/stream data provided by ExxonMobil for the proposed new Unit at the Baytown Olefins Plant. We confirm that the John Zink LRGO Multi-Point Ground Flare system is our recommended flare design to provide high efficiency 100% smokeless flaring in this service.

Based on our review of the process data, John Zink confirms our performance guarantee of the proposed ground flare burners as follows. We guarantee the hydrocarbon destruction efficiency to be 99.8% or greater in the following range of operation:

Burner operating pressure > 4 psig, and

Flare gas net heating value > 800 BTU/SCF

This 4 psig value would be above our de-stage pressure that we use to stage LRGO ground flare burners and the minimum 800 BTU/SCF is below the heating value of all of the streams identified in the processes/stream data provided by ExxonMobil. There is a separate elevated flare that will be used as a first stage to flare the low flow and/or low BTU streams outside this range of operation.

We understand that the proposed streams to the ground flare might include hydrogen. It is well accepted that hydrogen contributes to better combustion more than its volumetric heating value would imply, most notably as a result of a high flame speed and low stoichiometric air requirement. When hydrogen is present in the flare gas, its heating value shall be considered at an 'adjusted' value in calculation of the flare gas heating value, as has been used in the past.

JOHN ZINK®

If you have any additional questions or comments please feel free to contact us.

Best Regards,

Kevin Leary

Kevin Leary
Applications Engineering Director
Flare Systems
John Zink Co LLC

JOHN ZINK®

International Headquarters
PO Box 21220
Tulsa, OK 74121-1220
918/234-1800

November 5, 2012

Subject: LRGO Multi-Point Ground Flares
Flare Burner Emissions Guarantees

Ref: Mont Belvieu Plastics Plant.

Dear Sir / Madam:

John Zink Co has reviewed the processes/stream data provided by ExxonMobil for the proposed new Unit at the Mont Belvieu Plastics Plant We confirm that the John Zink LRGO Multi-Point Ground Flare system is our recommended flare design to provide high efficiency 100% smokeless flaring in this service.

Based on our review of the process data, John Zink confirms our performance guarantee of the proposed ground flare burners as follows. We guarantee the hydrocarbon destruction efficiency to be 99.8% or greater in the following range of operation:

Burner operating pressure > 4 psig, and

Flare gas net heating value > 800 BTU/SCF

This 4 psig value would be above our de-stage pressure that we use to stage LRGO ground flare burners and the minimum 800 BTU/SCF is below the heating value of all of the streams identified in the processes/stream data provided by ExxonMobil. There is a separate elevated flare that will be used as a first stage to flare the low flow and/or low BTU streams outside this range of operation.

We understand that the proposed streams to the ground flare might include hydrogen. It is well accepted that hydrogen contributes to better combustion more than its volumetric heating value would imply, most notably as a result of a high flame speed and low stoichiometric air requirement. When hydrogen is present in the flare gas, its heating value shall be considered at an 'adjusted' value in calculation of the flare gas heating value, as has been used in the past.

JOHN ZINK®

If you have any additional questions or comments please feel free to contact us.

Best Regards,

Kevin Leary

Kevin Leary
Applications Engineering Director
Flare Systems
John Zink Co LLC